Remarks

The Applicants have amended the Specification to change various terms into language and spellings that are more typical of American English.

The Applicant have added new Claims 24 and 25. Support may be found throughout the entire Specification. However, particular support may be found at pages 19 – 24 and page 25, paragraph 2.

Main Claims 1 and 14 have been amended in accordance with the Examiner's helpful suggestions. Particular support for a number of the amendments may be found in the paragraph bridging pages 10 and 11, as well as the paragraph bridging pages 11 and 12. Also, further support may be found in paragraph 3 of page 25.

Claims 3, 4, 5, 8, 10 and 17 have been amended in accordance with the Examiner's helpful suggestions and to make minor corrections to place them into better form for allowance. Withdrawal of the 35 U.S.C. §112 rejection is accordingly respectfully requested.

Claim 23 has been amended to remove multiple dependency.

A new Fig. 6 is enclosed which is in accordance with the description set forth in the Specification. Entry into the Official File is respectfully requested.

The Applicants acknowledge the rejection of Claims 1 – 9, 11, 13 – 17, 19, 20 and 22 under 35 U.S.C. §102 as being anticipated by Wilson et al. Wilson et al. discloses a microscopy imaging technique developed for improving the optical sectioning of confocal microscopes. Optical sectioning means that only in-focus light reflected or scattered from a focal plane is collected. A three-dimensional image can be constructed by combining the images from all focal planes.

The direction perpendicular to the focal plane is usually indicated as the z-direction. It is important that Wilson et al. improves the sectioning capability along the z-direction.

To provide for improved z-resolution, Wilson et al. teaches illuminating the object with a periodic pattern, while at least three images are recorded at different spatial phases of the pattern. The patterned illumination is reflected or scattered from the object towards the detector. The detector plane is conjugate to the plane in which the projected pattern is focused for enabling the optical sectioning (see page 5, paragraph 5).

The reflection or scattering are linear processes.

The light intensity reflected from the object has a linear relationship with the intensity of the illumination light. As an example, if the illumination light intensity is doubled, the reflected light intensity is doubled as well. The same logic applies to fluorescence detection as suggested by Wilson et al.

According to Wilson et al., the detected reflection/fluorescence light of the at least three patterned images allows a calculation of the whole image in the focal plane. The in-focus image is determined from the three image intensities with the pattern removal means (see page 7, paragraph 2).

The physical background of Wilson et al. is as follows: The collection of at least three images allows monitoring of the modulation of each pixel in dependence on the current illumination pattern. The question is how strong the reflection from a certain object location is varied with the pattern variation. On the basis of this modulation, the image of the focal plane can be calculated with an improved sectioning.

This conventional technique has a critical disadvantage. The patterned illumination and detection does not allow an essential improvement of the imaging resolution in the image plane, i.e., in the x-y-directions.

In sharp contrast, this invention teaches capturing partial images of an object wherein each partial image is taken with differing spatial patterns of at least two different object conditions influencing the light intensity being detectable on the object. An essential aspect of the invention is given by the fact that this influence corresponds to a non-linear dependency. The light from the objects depends non-linearly on the object condition.

The range of detectable spatial frequency components can be substantially increased due to this non-linear relationship. In particular, high spatial frequency components can be detected, which were not detectable with conventional linear imaging methods (see page 5, paragraph 3 to page 6, paragraph 2).

The subject matter of independent Claims 1 and 14 is novel over Wilson et al. because the detected light from the object has a non-linear relationship with the object conditions.

Wilson et al. does not disclose the detection of light having a non-linear dependency of the object conditions. Although it is correct and important to note that interference patterns formed through a phase mask or grating are non-linear in intensity as helpfully indicated by the Examiner, this non-linearity does not correspond to the non-linear dependency of the detectable light upon the object condition as claimed herein. The interference pattern formed with Wilson et al. represents the object condition. In this case, the object condition is the light intensity of the interference pattern as such. The light going out from the object is the reflected light in Wilson et al., which however,

has a linear relationship to the illumination light (see above). Withdrawal of the §102 rejection is accordingly respectfully requested.

The Applicants acknowledge the various rejections of selected ones of the claims under 35 U.S.C. §103 as being obvious over Wilson alone or taken with Spink and Aziz. With regard to the rejections under 35 U.S.C. §103, neither Wilson et al. taken alone nor Wilson et al. taken in combination with the other prior art teach or suggest leaving the conventional detection of (linearly) scattered light or emitted fluorescence light and to introduce object conditions influencing detectable light on the basis of a non-linear relationship.

In fact, Wilson et al. do not even consider the issue of resolution improvement apart from optical sectioning. The mathematical algorithm proposed by Wilson et al. is not well suited for image construction in the non-linear regime.

These inventors discovered that increasing the range of available spatial frequency components over the frequency range accessible in the linear regime with data obtained by patterned illumination. This is not taught or suggested by the prior art, whether taken individually or collectively. Withdrawal of the 35 U.S.C. §103 rejections is accordingly respectfully requested.

The Applicants enclose a Supplemental Information Disclosure Statement, together with copies of the publications and the usual PTO-1449 form. Entry into the Official File and consideration on the merits is respectfully requested.

In light of the foregoing, we respectfully submit that the entire Application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,

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